REMARKS

This response is being filed with a Request for Continued Examination (RCE). Claims 1-6 and 8-26 are pending in the application and were rejected. Claims 1, 13, 15, 16, 19 and 21 have been amended. New claim 27 has been added.

1. Rejections under Section 103

a. Rejections over Eiden

Claims 1-5 and 13-20 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent No. 6,259,091 ("Eiden"). The applicant respectfully disagrees, because Eiden fails to disclose or suggest at least mass selecting an ion beam at a mass-to-charge ratio, transmitting at least a portion of the mass selected ion beam into a collision cell, and subsequently mass analyzing at least a portion the ion beam at the same mass-to-charge ratio, which is expressly or implicitly required in each of the pending claims.

Amended claim 13 recites a method of operating a mass spectrometer that incorporates a collision cell pressurized with a target gas. According to the method, at least a portion of an ion beam is mass selected at an analyte mass to charge ratio. At least a portion of the mass selected ion beam is transmitted into the collision cell. From there, at least a portion of the ion beam is transmitted to a mass analyzer. Finally, the ion beam is mass analyzed in the mass analyzer at the analyte mass to charge ratio.

Eiden discloses an ICP mass spectrometer that is configured to produce an ion beam that has an increased proportion of analyte ions compared to carrier gas/matrix ions. *See* Abstract. Eiden accomplishes this by incorporating an ion trap or collision cell that contains a reagent gas that is capable of reacting selectively with the carrier gas ions, while allowing the analyte ions to pass essentially unaffected. *See* Abstract; column 4, lines 34-54.

In the passages cited by the Examiner (column 8, lines 25-67 and column 9, lines 1-40), Eiden describes an arrangement in which an ion beam containing analyte ions and carrier gas matrix ions is created by directing a plasma through two apertures and a lens stack. Column 8, lines 35-39. Continuing, Eiden explains that upon exiting the lens stack, the ion beam is directed into an "ion discriminating unit", a term Eiden uses to describe mass analyzers, from

which ions are selectively emitted according to their m/z or kinetic energy and directed to a charged particle detector for detection. *See* column 8, lines 43-49; 59-64. In particular embodiments described in Eiden, the "ion discriminating unit" is a quadrupole ion trap (column 9, lines 27, 28) or a linear quadrupole (column 8, lines 43-46 & FIG. 3).

To achieve its increased proportion of analyte ions compared to carrier gas or matrix ions, Eiden discloses incorporating a collision cell or ion trap somewhere between the first aperture (i.e., the aperture through which the plasma enters the system) and the charged particle detector. Column 9, lines 17-19; 25-27. More specifically, Eiden notes that a collision cell can be included before the lens stack, between elements of the lens stack, or between the lens stack and the mass analyzer. *See* column 9, lines 20-25. Alternatively, according to Eiden, an ion trap can likewise be incorporated at various locations. Column 9, lines 28-35. Eiden also notes that other mass analyzers can be used in combination with the ion trap, and can be located either before the ion trap or between the ion trap and the charged particle detector. Column 9, lines 35-39.

But while Eiden thus discloses using a collision cell or ion trap to eliminate carrier gas or matrix ions that ultimately make their way to the charged particle detector, nothing in the reference discloses or suggests performing a mass selection step before the beam enters the collision cell or ion trap, as the present claims require. As the applicant's specification explains, this mass selection step helps to reduce the contribution of artifact ions to the resulting mass spectrum by transmitting to the collision cell only ions having the same mass-to-charge ratio as will be detected by the main analyzing mass filter. *See* page 8, lines 17-20. This mass-to-charge filtering reduces the number of chemical species that enter the collision cell, and has the effect of substantially reducing the number of possible reactions that can occur in the cell. As the specification explains, "[a]ny artefact ion that is formed in the collision cell must therefore be a reaction product from an ion of the m/e that is selected in both the auxiliary mass filter [i.e., the mass selecting step] and main mass filter [the mass analyzing step]. The artefact ion must have a different m/e from that selected, and so will not be transmitted by the main mass filter." *See* page 8, lines 20-26. As a result, the mass spectrum will be essentially free from artifact ions.

In addition, the initial mass selecting step has the beneficial effect of significantly reducing the total charge entering the collision cell. As the specification explains, "[t]he ion

beam that leaves the device is much less intense, and exhibits little or no tendency to diverge under the influence of space-charge." *See* page 9, lines 10-12. This has the effect of greatly simplifying the ion optical elements required to transport the beam into the cell entrance, and of increasing the transmission of ions onto the axis of the cell entry aperture. Both of these result in increased transmission of desired analyte ions through the cell. And finally, since charge is conserved, reducing the total amount of charge in the collision cell also contributes to reducing the types of charged species that can be produced in the cell.

Eiden fails to recognize any of these benefits. At most, Eiden discloses that in some cases "other mass analyzers" could be used in its ion trap embodiments. But Eiden explains this suggestion only by noting that such other analyzers could be placed either before the ion trap or between the ion trap and the charged particle detector. While, with benefit of hindsight, it can be seen that by adding a mass analyzer in some of these locations it might be possible to perform a mass selection step before introducing the ion beam into the ion trap, nothing in Eiden even hints that such a mass selection step should be performed.

Moreover, failing to recognize the benefits of the preliminary mass selection step, Eiden also necessarily fails to disclose or suggest mass analyzing a portion of the ion beam at the same mass-to-charge ratio as used in such a mass selection, which the current claims also require. The Examiner admits that Eiden does not disclose this, but concludes that it would have been obvious to analyze the ion beam at the same mass-to-charge ratio as the earlier mass selection "in order to see a spectrum of the ions of interest." Office Action, p. 5. While this might be apparent to one having the benefit of the applicant's specification, the applicant submits that nothing in Eiden supports the Examiner's conclusion.

Because at least these limitations of claim 13 are neither disclosed nor suggested by Eiden, the applicant submits that no *prima facie* showing of obviousness has been made. Accordingly, claim 13 is allowable over Eiden and should be allowed. Claims 14-20 are dependent claims based either directly or indirectly on claim 13, and are therefore allowable for at least the same reasons.

Claims 1-5 and new claim 27 are apparatus claims directed to mass spectrometers that include, *inter alia*, a mass selective ion optical device, a collision cell, and a mass analyzer where the ion optical device and the mass analyzer are configured to operate at the same mass-to-

charge ratio. The applicant submits that each of these claims is allowable over Eiden for the same reasons as discussed above in the context of claim 13.

b. Rejections over Eiden and Tanner

Claims 6, 8-11, 21-24 and 26 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Eiden in view of U.S. Patent No. 6,140,638 ("Tanner"). Claims 21-24 and 26 are dependent claims derived from claim 13, and therefore include all of the limitations of that claim. Claims 6 and 8-11 are dependent claims derived from claim 1, and similarly include all limitations of that claim.

As discussed above, Eiden fails to disclose or suggest methods or apparatus in which a mass selection step is performed on an ion beam prior to introduction into a collision cell, and in which a subsequent mass analysis step is performed at the same mass-to-charge ratio as the initial mass selection. Tanner appears to be equally lacking, disclosing instead a system in which a mass selection is performed in the collision cell itself. *See* Abstract. Accordingly, claims 6, 8-11, 21-24 and 26 are allowable over the combination of Eiden and Tanner for at least the reasons discussed above with respect to claim 13.

c. Rejections over Eiden and Okamoto

Claims 12 and 25 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Eiden in view of U.S. Patent No. 5,049,739 ("Okamoto"). Claims 1 and 25 are dependent claims based on claims 1 and 13, respectively, and include all of the limitations of their parent claims.

As discussed above, Eiden fails to disclose or suggest methods or apparatus in which a mass selection step is performed on an ion beam prior to introduction into a collision cell, and in which a subsequent mass analysis step is performed at the same mass-to-charge ratio as the initial mass selection. Okamoto, which appears to disclose nothing more than the use of a collision cell, is equally lacking. Accordingly, claims 12 and 25 are allowable over Eiden and Okamoto for at least the reasons discussed above in the context of claim 13.

2. Conclusion

The applicant submits that all claims are in condition for allowance and asks that all claims be allowed. Enclosed is a check totaling $878.00, which includes $750 for the RCE fee,

$110 for the one-month Petition for Extension of Time fee, and $18 for the excess claim fee.

Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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